

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,165,624 B1  
APPLICATION NO. : 09/292152  
DATED : January 23, 2007  
INVENTOR(S) : Fischer

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the title page under item (57), change "89 claims," to -- 121 claims, --

Column 25, line 22, that portion of claim 89 reading "of about 15" should read --ranging from 15--;  
line 23, that portion of claim 89 reading ", and less than about 40" should read --to 40--.

Column 26, line 1, that portion of claim 89 reading "mounted with" should read --including--; line 24, insert the following claims, claim 90 to claim 121:

--90. The early suppression fast response pendent-type fire protection sprinkler of claim 89, 108, 109, or 111, wherein the at least two slots of each of the at least two grouping of slots define at least two reentrant slots.

91. The early suppression fast response pendent-type fire protection sprinkler of claim 90, wherein each of the at least two reentrant slots extend inwardly along reentrant slot centerlines, and each of the at least two reentrant slots has a first width transverse to its reentrant slot centerline in a region of the peripheral edge and a second slot width transverse to its reentrant slot centerline in a region spaced inwardly, toward the deflector axis, relative to the region of the peripheral edge, the second width being greater than the first width.

92. The early suppression fast response pendent-type fire protection sprinkler of claim 89, 108, 109, or 111, wherein the outlet defines an outlet axis and the sprinkler further comprises an apex element defining a curve in the direction of the outlet axis.

93. The early suppression fast response pendent-type fire protection sprinkler of claim 89, 108, 109, or 111, wherein the sprinkler is suited for installation with the deflector disposed up to 18 inches below a ceiling.

94. The early suppression fast response pendent-type fire protection sprinkler of claim 89, 108, 109, or 111, wherein the deflector has a thickness measured from the first surface in the direction of fluid flow equal to or greater than about 0.06 inch.

95. The early suppression fast response pendent-type fire protection sprinkler of claim 89, 108, 109, or 111, wherein the outlet defines a longitudinal axis along the sprinkler body, the sprinkler further comprising an apex element aligned with the outlet axis, the deflector mounted to the apex element.

96. The early suppression fast response pendent-type fire protection sprinkler of claim 95, the body further comprising a pair of arms mounted about the body, the arms joining at the apex element.

97. The early suppression fast response pendent-type fire protection sprinkler of claim 95, further comprising a plate assembly to close the outlet and a thermally responsive element disposed between the outlet and the apex to support the plate.

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98. The early suppression fast response pendent-type fire protection sprinkler of claim 97, wherein the thermally responsive element comprises a fusible solder alloy.

99. The early suppression fast response pendent-type fire protection sprinkler of claim 97, wherein the thermally responsive element has a temperature rating between 165°F (74 °C) and 214 °F (101 °C).

100. The early suppression fast response pendent-type fire protection sprinkler of claim 97, further comprising a strut and a lever to transfer a force from the thermally responsive element to the plate assembly, the sprinkler further comprising a threaded fastener engaged with the apex to coaxially support the lever.

101. The early suppression fast response pendent-type fire protection sprinkler of claim 89, 108, 109, or 111, wherein the K-factor of the body is 25.2.

102. The early suppression fast response pendent-type fire protection sprinkler of claim 89, 108, 109, or 111, wherein the first surface opposes the flow of fluid to deflect the flow of fluid to suppress a fire in the at least one of a single rack storage, double row rack storage, and multiple row rack storage, the at least one storage further includes portable storage.

103. The early suppression fast response pendent-type fire protection sprinkler of claim 102, wherein at least one storage includes at least one of palletized and solid pile storage.

104. The early suppression fast response pendent-type fire protection sprinkler of claim 103, wherein the at least one storage includes encapsulated or non-encapsulated materials.

105. The early suppression fast response pendent-type fire protection sprinkler of claim 103, wherein the at least one storage includes cartoned unexpanded plastics.

106. The early suppression fast response pendent-type fire protection sprinkler of claim 103, wherein the at least one storage includes at least one of Class I, Class II, Class III and Class IV commodities.

107. The early suppression fast response pendent-type fire protection sprinkler of claim 103, wherein the at least one storage includes at least one of roll paper and rubber tires.

108. An early suppression fast response pendent-type fire protection sprinkler suitable for use in accordance with one or more of NFPA 13, NFPA 231 and NFPA 231C, the sprinkler comprising:

a sprinkler body defining an orifice and an outlet that delivers a flow of fluid from a source, the sprinkler body having a K-factor of about 25 and a minimum design flowing pressure ranging from 20 pounds per square inch to 45 pounds per square inch, at a most hydraulically remote sprinkler; and

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a deflector including a first surface opposed to the flow of fluid from the outlet to deflect the flow of fluid to suppress a fire in at least one of a single row rack storage, double row rack storage and multiple row rack storage having a maximum storage height of 30 feet in a storage area having a maximum ceiling height of 35 feet, with no open containers and no solid shelves, the deflector defining at least two grouping of slots disposed about a deflector axis, each of the at least two grouping of slots having at least two slots, each of the slots in each of the at least two grouping of slots extending from the first surface through the deflector, and from slot openings at an outer peripheral edge of the deflector inwardly from the peripheral edge toward the deflector axis, each slot of one grouping of the at least two groupings of slots having a first width generally transverse to a first radial length extending perpendicular to the deflector axis, each slot of another grouping of the at least two groupings of slots having a second width different than the first width and generally transverse to a second radial length extending perpendicular to the deflector axis that is different than the first radial length.

109. An early suppression fast response pendent-type fire protection sprinkler suitable for use in accordance with one or more of NFPA 13, NFPA 231 and NFPA 231C. the sprinkler comprising:

a sprinkler body defining an orifice and an outlet that delivers a flow of fluid from a source, the sprinkler body having a K-factor of about 25 and a minimum design flowing pressure ranging from 25 pounds per square inch to 50 pounds per square inch, at a most hydraulically remote sprinkler; and

a deflector including a first surface opposed to the flow of fluid from the outlet to deflect the flow of fluid to suppress a fire in at least one of a single row rack storage, double row rack storage and multiple row rack storage having a maximum storage height of 35 feet in a storage area having a maximum ceiling height of 40 feet, with no open containers and no solid shelves, the deflector defining at least two grouping of slots disposed about a deflector axis, each of the at least two grouping of slots having at least two slots, each of the slots in each of the at least two grouping of slots extending from the first surface through the deflector, and from slot openings at an outer peripheral edge of the deflector inwardly from the peripheral edge toward the deflector axis, each slot of one grouping of the at least two groupings of slots having a first width generally transverse to a first radial length extending perpendicular to the deflector axis, each slot of another grouping of the at least two groupings of slots having a second width different than the first width and generally transverse to a second radial length extending perpendicular to the deflector axis that is different than the first radial length.

110. The early suppression fast response pendent-type fire protection sprinkler of claim 109, wherein the minimum design flowing pressure is 40 pounds per

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square inch.

111. An early suppression fast response pendent-type fire protection sprinkler suitable for use in accordance with one or more of NFPA 13, NFPA 231 and NFPA 231C, the sprinkler comprising:

a sprinkler body defining an orifice and an outlet that delivers a flow of fluid from a source, the sprinkler body having a K-factor of about 25 and a minimum design flowing pressure ranging from 40 pounds per square inch to 65 pounds per square inch, at a most hydraulically remote sprinkler; and

a deflector including a first surface opposed to the flow of fluid from the outlet to deflect the flow of fluid to suppress a fire in at least one of a single row rack storage, double row rack storage and multiple row rack storage having a maximum storage height of 40 feet in a storage area having a maximum ceiling height of 45 feet, with no open containers and no solid shelves, the deflector defining at least two grouping of slots disposed about a deflector axis, each of the at least two grouping of slots having at least two slots, each of the slots in each of the at least two grouping of slots extending from the first surface through the deflector, and from slot openings at an outer peripheral edge of the deflector inwardly from the peripheral edge toward the deflector axis, each slot of one grouping of the at least two groupings of slots having a first width generally transverse to a first radial length extending perpendicular to the deflector axis, each slot of another grouping of the at least two groupings of slots having a second width different than the first width and generally transverse to a second radial length extending perpendicular to the deflector axis that is different than the first radial length.

112. The early suppression fast response pendent-type fire protection sprinkler of claim 111, wherein the maximum storage height is about 40 feet, the maximum ceiling height is about 45 feet, and the minimum design flowing pressure is 60 pounds per square inch.

113. An early suppression fast response pendent-type fire protection sprinkler suitable for use in accordance with one or more of NFPA 13, NFPA 231 and NFPA 231C, the sprinkler comprising:

a sprinkler body defining an orifice and an outlet along a longitudinal axis that delivers a flow of fluid from a source, the sprinkler body having a K-factor of about 25 and a base having a pair of arms diametrically mounted about the base;

a plate assembly axially aligned and adjacent the outlet and a thermally responsive element supporting the plate assembly to close the outlet;

an apex element disposed along the longitudinal axis, the pair of arms being joined at the apex element, the apex element defining a curve in the direction of the longitudinal axis;

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a deflector affixed to the apex element, the deflector including a first surface opposed to the flow of fluid from the outlet, the deflector defining at least two grouping of slots disposed about a deflector axis, each of the at least two grouping of slots having at least two slots, each of the slots in each of the at least two grouping of slots extending from the first surface through the deflector, and from slot openings at an outer peripheral edge of the deflector inwardly from the peripheral edge toward the deflector axis, each slot of one grouping of the at least two groupings of slots having a first width generally transverse to a first radial length extending perpendicular to the deflector axis, each slot of another grouping of the at least two groupings of slots having a second width different than the first width and generally transverse to a second radial length extending perpendicular to the deflector axis that is different than the first radial length, wherein the first surface being configured to deflect the flow of fluid to suppress a fire in at least one or a single row rack storage, double row rack storage, multiple row rack storage and portable row rack storage having a maximum storage height in a storage area having a maximum ceiling height, with no open containers and no solid shelves, the body having a minimum design flowing pressure measured in pounds per square inch at a most hydraulically remote sprinkler for the given maximum storage height and the maximum ceiling height,

wherein when the maximum storage height is about 35 feet and the maximum ceiling height is about 40 feet, the minimum design flowing pressure ranging from 25 pounds per square inch to 50 pounds per square inch, and

wherein when the maximum storage height is about 40 feet and the maximum ceiling height is about 45 feet, the minimum design flowing pressure ranging from 40 pounds per square inch to 65 pounds per square inch.

114. The early suppression fast response pendent-type fire protection sprinkler of claim 113, wherein the at least two slots of each of the at least two grouping of slots define at least two reentrant slots.

115. The early suppression fast response pendent-type fire protection sprinkler of claim 114, wherein each of the at least two reentrant slots extend inwardly along reentrant slot centerlines, and each of the at least two reentrant slots has a first width transverse to its reentrant slot centerline in a region of the peripheral edge and a second slot width transverse to its reentrant slot centerline in a region spaced inwardly, toward the deflector axis, relative to the region of the peripheral edge, the second width being greater than the first width.

116. The early suppression fast response pendent-type fire protection sprinkler of claim 113, wherein when the maximum storage height is about 35 feet and the maximum ceiling height is about 40 feet, the minimum design flowing pressure being 40 pounds per square inch.

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117. The early suppression fast response pendent-type fire protection sprinkler of claim 113, wherein when the maximum storage height is about 40 feet and the maximum ceiling height is about 45 feet, the minimum design flowing pressure being 60 pounds per square inch.

118. The early suppression fast response pendent-type fire protection sprinkler of claim 113, wherein the sprinkler is suited for installation with the deflector disposed up to 18 inches below a ceiling.

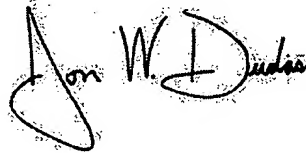
119. The early suppression fast response pendent-type fire protection sprinkler of claim 113, wherein the deflector has a thickness measured from the first surface in the direction of fluid flow equal to or greater than about 0.06 inch.

120. The early suppression fast response pendent-type fire protection sprinkler of claim 113, wherein the K-factor of the sprinkler body is 25.2.

121. The early suppression fast response pendent-type fire protection sprinkler of claim 113, wherein the apex element includes a central bore having a threaded fastener disposed therein, the sprinkler further comprising a lever and strut engaged with the thermally responsive element to support the thermally responsive element, the threaded fastener further engaging the lever and strut along the longitudinal axis.--

Signed and Sealed this

Twentieth Day of March, 2007

A handwritten signature in black ink, appearing to read "Jon W. Dudas", is written over a faint, circular embossed seal of the United States Patent and Trademark Office.

JON W. DUDAS  
*Director of the United States Patent and Trademark Office*